

Claims

What is claimed is:

- 1 1. A silicon-containing resist composition, said composition comprising
2 (a) an acid-sensitive imaging polymer,
3 (b) a radiation-sensitive acid generator, and
4 (c) a non-polymeric silicon additive.
- 1 2. The resist composition of claim 1 wherein said imaging polymer contains
2 a monomer selected from the group consisting of a cyclic olefin, an
3 acrylate and a methacrylate.
- 1 3. The resist composition of claim 1 wherein said imaging polymer contains
2 fluorine moieties.
- 1 4. The resist composition of claim 1 wherein said composition contains at
2 least about 5 wt.% silicon based on weight of said imaging polymer.
- 1 5. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive contains at least about 10 carbon atoms.
- 1 6. The resist composition of claim 1 wherein said imaging polymer contains
2 silicon.
- 1 7. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive contains acid labile moieties that inhibit solubility of said
3 composition in aqueous alkaline solutions.
- 1 8. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive contains at least two silicon-containing moieties.

- 1 9. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive contains at least one ring structure.
- 1 10. The resist composition of claim 1 wherein said non-polymeric silicon
2 additive has a weight average molecular weight of less than 3000 and a
3 sublimation temperature or boiling point of at least 150°C.
- 1 11. A method of forming a patterned material structure on a substrate, said
2 material being selected from the group consisting of semiconductors,
3 ceramics and metals, said method comprising:
- 4 (A) providing a substrate with a layer of said material,
- 5 (B) forming a planarizing layer over said material layer,
- 6 (C) applying a resist composition over said planarizing layer to form a
7 resist layer, said resist composition comprising:
8 (a) an acid-sensitive imaging polymer,
9 (b) a radiation-sensitive acid generator, and
10 (c) a non-polymeric silicon additive.
- 11 (D) patternwise exposing said substrate to radiation whereby acid is
12 generated by said radiation-sensitive acid generator in exposed
13 regions of said resist layer by said radiation,
- 14 (E) contacting said substrate with an aqueous alkaline developer
15 solution, whereby said exposed regions of said resist layer are
16 selectively dissolved by said developer solution to reveal a
17 patterned resist structure,

FIG. 10

- 18 (F) transferring resist structure pattern to said planarizing layer, by
19 etching into said planarizing layer through spaces in said resist
20 structure pattern, and
- 18 (G) transferring said structure pattern to said material layer, by etching
19 into said material layer through spaces in said planarizing layer
20 pattern.
- 1 12. The method of claim 11 wherein said etching of step (G) comprises
2 reactive ion etching.
- 1 13. The method of claim 11 wherein said radiation has a wavelength of about
2 193 nm.
- 1 14. The method of claim 11 wherein said substrate is baked between steps
2 (D) and (E).
- 1 15. The method of claim 11 wherein said imaging polymer contains a
2 monomer selected from the group consisting of a cyclic olefin, an
3 acrylate and a methacrylate.
- 1 16. The method of claim 11 wherein said imaging polymer contains fluorine
2 moieties.
- 1 17. The method of claim 11 wherein said composition contains at least about
2 5 wt.% silicon based on weight of said imaging polymer.

- 1 18. The method of claim 11 wherein said non-polymeric silicon additive
2 contains at least about 10 carbon atoms.
- 1 19. The method of claim 18 wherein said imaging polymer contains
2 silicon.
- 1 20. The method of claim 11 wherein said non-polymeric silicon additive
2 contains acid labile moieties that inhibit solubility of said composition in
3 aqueous alkaline solutions.

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